Sum the series

$$-\frac{1}{2}\cdot\frac{1^3x^3}{3}+\frac{1\cdot3}{2\cdot4}\cdot\frac{2^3x^5}{5}-\frac{1\cdot3\cdot5}{2\cdot4\cdot6}\frac{3^3x^7}{7}+\cdots.$$

SOLUTION BY ELIJAH SWIFT, University of Vermont.

Differentiate the given series (permissible, as a power series, convergent $|x| < 1$). Dividing by x^2, we have the series,

$$P(x) = -\frac{1}{2}\cdot1^3+\frac{1\cdot3}{2\cdot4}2^3(x^2)-\frac{1\cdot3\cdot5}{2\cdot4\cdot6}3^3(x^2)^2+\cdots.$$

If we substitute z for x^2 and then integrate this from 0 to z, divide by z and integrate again, and repeat this process, we arrive at a familiar series. (We are integrating a function which is obviously continuous at $z = 0$.) The resulting series is

$$-\frac{1}{2}z+\frac{1\cdot3}{2\cdot4}z^2-\frac{1\cdot3\cdot5}{2\cdot4\cdot6}z^3+\cdots=(1+z)^{-1/2}-1.$$

Reversing the processes we have carried out on the series, we finally obtain the original series in closed form. Thus, differentiating $(1 + z)^{-1/2} - 1$ and multiplying by z, repeating this process, and differentiating the result, we have, putting $z = x^2$,

$$P(x) = \frac{-x^4 + 10x^2 - 4}{8(1 + x^2)^{7/2}}.$$

Multiplying this by x^2, integrating and determining the constant of integration, the value of the given series is

$$\frac{1}{8}\left\{\frac{3x}{(1+x^2)^{5/2}}-\frac{5x}{(1+x^2)^{3/2}}+\frac{3x}{(1+x^2)^{1/2}}-\log(x+\sqrt{1+x^2})\right\}$$

$$=\frac{x+x^3+3x^5}{8\sqrt{(1+x^2)^5}}-\frac{1}{8}\log(x+\sqrt{1+x^2}).$$

Also solved by H. L. OLSON and the PROPOSER.

UNDERGRADUATE MATHEMATICS CLUBS.

EDITED BY R. C. ARCHIBALD, Brown University, Providence, R. I.

CLUB ACTIVITIES.

THE JUNIOR MATHEMATICAL CLUB OF THE UNIVERSITY OF CHICAGO, Chicago, Ill. [*1918*, 34–5].[1]

November 15, 1916: "Newton" by Gail F. Moulton '19 and Thomas McN. Simpson Gr.

November 29: "Elementary notions of line complexes and congruences" by Levi S. Shively Gr.

December 13: "Notes in the history of the theory of functions of a complex variable" by Joseph L. Walsh Gr.

January 14, 1917: "Quadratic forms" by James E. McAtee Gr.

January 28: "Transformation of Coördinates" by Kenneth Lamson Gr.

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[1] This abbreviation indicates that on pages 34–35 of this MONTHLY, 1918, there may be found further information concerning The Junior Mathematical Club.

February 14: "An Application of Bayes's theorem[1] in the theory of probabilities" by Professor William D. Cairns of Oberlin College.

February 28: "Cauchy" by George H. Cresse Gr.; "Poncelet" by Ernest P. Lane Gr.; "Gauss" by Mary C. Suffa Gr.; "Weierstrass" by Webster G. Simon Gr.

April 11: "Elementary notions of continuous groups" by Israel A. Barnett Gr.

April 25: "Note on a set of postulates" by William P. Ott Gr.

May 9: "Plücker" by Orrin W. Albert Gr.

May 23: "The velocity of a planet" by George H. Cresse Gr.; "The density of a sphere" by Ernest P. Lane Gr.; "Riemann" by Cornelius Gouwens Gr.

June 6: "Infinite determinants" by William G. Simon Gr.

January 16, 1918: "Twisted curves in vector analysis" by Ernest P. Lane Gr.

January 30: "Gauss's reciprocity theorem" by Horace Alson Gr.

February 13: "The limaçon" by Gladys Gibbens Gr.

February 27: "Lagrange" by Charles C. Spooner Gr.

March 13: "Statistical interpretation of entropy" by Edward S. Akeley Gr.

April 17: "The fundamental theorem of algebra" by Ernest Zeisler '19.

May 1: "Some elementary geometric concepts of the complex variable" by Tel C. Kimball Gr.

May 15: "The discovery of Neptune" by Frederick C. Leonard '18.

May 29: "Reflected curves" by Louis Shapotken '18.

THE GRINNELL COLLEGE MATHEMATICS CLUB, Grinnell, Iowa.

This club was founded in March, 1917. At the five meetings during the remainder of the year the programs included the following papers: "The problem of Apollonius" by Professor Raymond B. McClennon; "Planimeters" by Professor William J. Rusk; "Geometry of four dimensions" by Lloyd W. Taylor, Jr., instructor; "Applications of Mathematics to gunnery" by Earl Kilgore '18.

During 1917–18 the club functioned for the first semester only. Linn Smith '19, and Ethel Rivers '17, were respectively president and vice-president. The topics discussed included, "Mathematical fallacies" by Linn Smith '19, and "Squaring the circle" by Fay Breckenridge '18.

THE MATHEMATICAL CLUB, Harvard University, Cambridge, Mass.

[*1918*, 186–7].

October 11, 1916: "Geometrical constructions with special instruments" by Professor Charles L. Bouton.

October 25: "Functions of infinitely many variables" by Dr. William L. Hart, Benjamin Peirce instructor.

November 8: "A classification of closed curves on a surface of finite connectivity by means of a canonical set of closed curves" by Harold C. M. Morse Gr.

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[1] Cf. I. Todhunter, *A History of the Mathematical Theory of Probability*, Cambridge and London, 1865, pp. 294 ff.

November 22: "Primary quadratic forms" by Dr. Tracey A. Pierce, instructor.

December 6: "Some intimately related linear equations" by Professor Roland G. D. Richardson of Brown University, Providence, R. I.

January 23, 1917: "Determinants of many dimensions" by Lepine H. Rice Gr.

February 21: "Minkowski's contributions to pure mathematics" by Dr. Edward A. Kircher, Benjamin Peirce instructor.

March 7: "A theory of rectangular matrices" by Professor Clarence L. E. Moore of Massachusetts Institute of Technology.

March 21: "Certain heresies in the teaching of elementary dynamics" by Professor Edward V. Huntington.

April 4: "The fundamental theorem of algebra" by Forrest H. Murray Gr.

May 2: "What is real algebra" by Dr. Henry M. Sheffer, instructor in philosophy.

May 16: "Independent postulates for groups and fields" by Ronald M. Foster '17.

The average attendance at Harvard meetings during 1916–17 was about 26, during 1917–18 about 20.

March 6, 1918: "Calculating machines" by Mr. Modern of the Monroe Calculating Machine Company.

March 20: "Bernhard Riemann" by Professor William F. Osgood.

April 3: "Pencils of Lines" by Dr. Alton L. Miller, instructor.

May 1: "Areal derivatives" by Dr. Gabriel M. Green, instructor.

May 15: "Slide rules" by Professor William R. Ransom of Tufts College, Tufts College, Mass.   Professor G. D. Birkhoff was elected faculty adviser, during 1918–19, with power to call a meeting for election of officers.

THE MATHEMATICS CLUB OF THE UNIVERSITY OF KANSAS, Lawrence, Kansas. [*1918*, 35–6].

This club was organized in December, 1911.   The following programs supplementing those already given were issued annually in printed form:

October 5, 1914: Election of officers.

October 12: "Mathematics in astronomy" by Professor Ellis B. Stouffer.

October 26: "Addition and subtraction applied to geometry according to the principles of Grassmann" by Edward H. Carus '12, instructor.

November 8: "Who's who in mathematics" by Charles F. Green '14.

November 22: "The fourth dimension" by Laurens E. Whittemore Gr.

January 11, 1915: "The three problems of antiquity" by Cyril A. Nelson Gr.

January 25: "What is mathematics" by Professor Ulysses G. Mitchell.

February 15: "A discussion of the gyroscope" by Wendell M. Latimer '15.

March 8: "Current events in mathematics" by Eva M. Coors '16.

March 22: "The polar planimeter" by Austin Bailey '16.

April 12: "Insurance mathematics" by Professor Charles H. Ashton.

April 26: "Napier and the invention of logarithms" by Ethel W. Mallonee Gr.

May 10: "Quadric surfaces" by Ottilia W. Ducker Gr.

May 24: "A trip to infinity" by Professor John N. Van der Vries.

September 27: Election of officers.

October 11: "Fermat's theorem and allied topics" by Dr. Solomon Lefschetz, instructor.

October 25: "Non-Euclidean geometry" by Jessie Jacobs '15.

November 8: "Line construction" by Ada H. West Gr.

November 22: "Who's who in mathematics in America" by Professor Mitchell; "Mathematical reference books" by Professor Stouffer.

December 13: "Curve tracing" by Paul W. Harnley '15.

January 10, 1916: "Methods of computing errors" by Professor Herbert E. Jordan.

February 14: "Quadratic forms in number theory" by Mabel W. Arnett '15.

February 28: "Elements of orbits of heavenly bodies and Kepler's laws" by Cora J. Shinn '17.

March 3: "Mathematical Fallacies" by James B. Ramsey '16.

March 27: "Some definite integrals" by Arthur W. Larsen, instructor.

April 10: "The origin of the calculus" by Laura J. McKay '16.

April 24: "The mathematics of the calendar" by Leonard L. Steimley, instructor.

May 8: "Finite geometry" by Cyril A. Nelson '14.

May 28: "Review of Memorabilia Mathematica" [Edited by R. E. Moritz] by Florence R. Scheidenberger '15.

September 25: "Methods and customs in German Universities" by Professor Ashton.

October 9: "The mysteries of the fourth dimension" by Margaret Coleman '17.

October 23: "Mathematical games" by Professor Van der Vries.

November 6: "Three famous problems of antiquity" by Hazel E. Parkinson '18.

November 20: "Some simple applications of vector analysis" by Arthur W. Larsen, instructor.

December 11: "The slide rule" by Hobart F. Lutz '19.

January 8, 1917: "Magic squares and cubes" by Cora J. Shinn '18.

January 30: "Japanese and Chinese mathematics" by Frances E. Adams '18.

February 12: "Adding and multiplying machines" by Professor John J. Wheeler.

February 26: "Properties of the number 9" by Marie O. Graff '17.

March 12: "How to draw a straight line" by Earle B. Miller, instructor.

March 26: "Paper folding" by Bernice Boyles '18.

April 9: "Review of De Morgan's Budget of Paradoxes" by Helen R. Garman '18.

April 23: "The planimeter and rectifier" by Lewis M. Hull '17.

May 14: "Mathematical recreations" by Mignonette Uhl '18.

May 25: Picnic.

THE WHITE MATHEMATICS CLUB AT THE UNIVERSITY OF KENTUCKY, Lexington, Ky. [*1918*, 90].

The following list of programs is supplementary to that previously given.

October 11, 1916: "How to draw a straight line" by Professor Paul P. Boyd.

October 18: "Exceptions to the laws of radicals" by Professor Elijah L. Rees.

October 25: "On the contraction of homogeneous spheroids" by Professor Harold H. Downing.

November 1: "Intrinsic equations" by Professor Joseph W. Davis.

November 8: "Theorems relating to the three normals, through a point, to a parabola" by Vernon C. Grove Gr.

November 15: "Elliptic integrals in the problems of the inverse fifth power" by Harry R. Allen Gr.

November 22: "Eclipses" by Homer L. Reid Gr.

December 6: "Graphical construction for a function of a function and for a function given by a pair of parametric equations" [review of W. H. Roever's article in this MONTHLY, 1917] by Clarence W. Harney '17.

December 13: "Linkages" (continued) by Professor Boyd.

December 20: "Trisection of an angle by means of conics" by Professor Rees.

January 6, 1917: "Areas of pedal curves" by Professor Davis.

January 10: "Helmholtz's contraction theory" by Professor Downing.

February 7: "History of Egyptian and Phœnician Mathematics" by Vernon G. Grove Gr.

February 14: "History of Grecian Mathematics" by Harry R. Allen Gr.

February 28: "History of Hindoo and Arabic mathematics" by Homer L. Reid Gr.

March 14: "History of Italian mathematics" by Clarence W. Harney '17.

March 23: "History of English mathematics" by H. L. Reid Gr.

March 28: "History of French mathematics" by V. G. Grove Gr.

April 4: "History of German mathematics" by H. R. Allen Gr.

April 17: "A chart of mathematical history" by Professor Rees.

April 25: "Non-Euclidean geometry" by Myrtle R. Smith '17.

May 1: "The general linear transformation by linkages" by Professor Boyd.

May 9: "Perturbations treated geometrically" by Professor Downing.

May 18: "Pythagoras and the Pythagorean theorem" by Mary Beall '19.

January 16, 1918: "Integrals related to the Lebesgue integrals" by Professor Davis.

January 23: "A discussion of the Rochester plan" [review of W. Betz's article, on "The Teaching of Mathematics in the Junior High School," in *The Mathematics Teacher*, December, 1917] by Professor Davis; "Mathematical requirements in certain high schools" by Miss Mamie Schmidt of the Lexington High School.

February 7: "Review of Townsend and Goodenough's Calculus" by Professor Rees.

February 14: "The cyclo-harmonograph"[1] by Professor Boyd.

February 20: "Arithmetical progression of the nth order" by Professor Downing.

February 27: "Introduction to infinitesimal analysis" by Professor Davis.

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[1] See R. E. Moritz, (1) "The Cyclo-harmonograph; an instrument for drawing large classes of important higher plane curves," *Scientific American Supplement*, August 5, 1916; (2) On the construction of certain curves given in polar coördinates," in this MONTHLY, May, 1917.

March 6: "A theorem of mechanics proved by vector analysis" by Professor Rees.

March 27: "Point sets" by Professor Downing.

April 3: "Point sets" (continued) by Professor Davis.

April 10: "Point sets" (continued) and "Shortest distance between two points" by Professor Downing.

April 17: "Point sets" (continued) by Professor Davis.

April 24: "Solution of two geometrical problems" by Professor Rees; "Point sets" (continued) by Professor Downing.

May 8: "Photogrammetry" by V. G. Grove Gr.

May 15: "Some applications of vector analysis to kinematics" by H. R. Allen Gr.

THE MATHEMATICS CLUB OF THE UNIVERSITY OF MAINE, Orono, Me. [*1918*, 132].

The following programs are supplementary to those already given:

March 8, 1916: "Simple method of constructing normals to the parabola" [review of S. G. Barton's paper in this MONTHLY, June, 1914] by Maynard F. Jordan '17: "Life of the late Simon Newcomb" by Charles I. Emery '17.

April 5: "Mathematics in the secondary school" by Hoyt D. Foster '16; "Addition formulas for the trigonometric functions" by Marie F. Foster '16; "Fallacies in geometry" by Professor Lowell J. Reed.

April 19: "Methods of teaching high school mathematics" by James A. Hamlin, principal of Old Town High School.

May 31: "Systems of ovals and the ellipse as a special case" by Zella Colvin '16; "Rolling curves" by Raymond D. Douglass '15.

October 11: Social meeting at the home of Professor James N. Hart; there was a short program consisting of competition between several teams in solving problems and mathematical puzzles.

October 25: "Applications of partial derivatives in relation to the study of conics" by Sumner C. Cobb '17; "Life and work of Charles P. Steinmetz"[1] by Clarence H. Drisko '18.

November 8: "On the solutions of linear equations having small determinants" [review of F. R. Moulton's article in this MONTHLY, October, 1913] by Charles I. Emery '17.

November 22: "Curve fitting" by John I. Miner, computer in the Agricultural Experiment Station; "Life of Percival Lowell, astronomer" by Edith De Beck '18.

December 6: "The fourth dimension" by Dr. Norbert Wiener, instructor.

January 17, 1917: "Solution of certain problems prepared in Granville's and Smith's calculus text books with erroneous answers" by Lester C. Swicker '19; "Methods and symbols used in mathematics before the sixteenth century" by Professor Truman L. Hamlin.

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[1] Professor of electro-physics at Union College, Schenectady, N. Y.

February 14: "Solution of problems that appeared in the AMERICAN MATHE-
MATICAL MONTHLY and in *School Science and Mathematics* by Samuel Wise-
man '19.

April 18: "Some astronomical topics of current interest" by Professor Hart.

May 16: "A geometrical interpretation of Taylor's formula" by Professor
Harley R. Willard.

December 19, 1917: "History of trigonometry" by Edith L. Deering '21; "The
nine-point circle" by Edith DeBeck '18.

February 27, 1918: "The eclipse of June, 1918" by Professor Hart; "Comets"
by Samuel Guptill '20.

March 27: "Applications of trigonometry to railway curves" by Alpheus C.
Lyon, professor of civil engineering; "Ptolemy's theorem and its applica-
tions" by Albert J. Bedard '21.

THE MATHEMATICS CLUB OF THE UNIVERSITY OF NORTH CAROLINA, Chapel
Hill, N. C. [*1918*, 90–91].

The club members are drawn not only from the department of mathematics
but also from the departments of chemistry, physics, and civil and electrical
engineering. It has been the aim of the club "to bring teacher and student into
closer and more sympathetic contact, to call to the student's attention matters
for which opportunity did not present itself in class, to correlate more closely
the work of allied departments, to arouse the interest and to foster the develop-
ment of superior men while lending help and courage to the weaker. The pro-
grams have been limited both as to number of papers and as to the time occupied
by them, so that problems of interest could be proposed and discussed." These
have been conducted by the club's secretary, John W. Lasley, instructor.

The following list of programs supplements that previously given:

November 28, 1916: "The differential coefficient viewed as a singular form"
by Professor William Cain; "Mathematical requirements for electrical engi-
neering students" by Elden I. Staples, instructor in electrical engineering.

January 9, 1917: "The logic of mathematics" by Henry H. Williams, professor
of philosophy.

February 13: "The inscription of a regular 17-gon in a circle" by Sherman B.
Smithey '17; "Some characteristic theorems in the foundations of geometry"
by Professor Archibald Henderson.

March 6: "A note on linear equations" by Mr. Lasley; "The teaching of mathe-
matics in the high school" by Lester A. Williams, professor of school adminis-
tration.

January 7, 1918: "Mathematics historically considered" by Professor Cain.
(Lecture open to the public.)

February 6: "A method for finding the complex roots of a cubic equation" by
Mr. Lasley.

February 18: "Some aspects of modern geometry" by Professor Henderson
(Public lecture).

March 4: "The origin and development of number" by Mr. Lasley (Public lecture).

March 18: "War maps and the use of scales" by Thomas F. Nickerson, associate professor of civil engineering. (Public lecture.)

April 1: "Common sense in mathematics" by Dr. A. Wilson Hobbs, instructor in mathematics. (Public lecture.)

April 22: "Surveying" by Marvin H. Stacy, professor of civil engineering. (Public lecture.)

April 30: "Complex numbers" by Houston Everette '20.

THE MATHEMATICS CLUB OF THE UNIVERSITY OF OREGON, Eugene, Oregon. [*1918*, 134–135].

The remaining programs in 1917–18 were as follows:

February 27: "Solution of the fifth degree equation" by Mary Mottley '19; "The Leibnitz-Newton controversy over the discovery of the calculus" by Glen Langdon '20.

May 15: "Theory of numbers, especially prime numbers, congruences, and Pythagorean numbers" by Olga Soderstrom '18; "Septic curves" by Dr. Roy M. Winger, instructor.

VINCULUM, University of Pennsylvania, Philadelphia, Pa.

This club was organized in May, 1917, "to further interest in mathematics, to provide a seminar for undergraduate students, and to promote sociability among those interested in the subject. Membership is limited to women students, in any department, in any class, who are majoring in mathematics.[1] During the past year there were 20 members and the average attendance at meetings, including visitors, was 25.

Officers 1917–18: President, Edith P. Levinson '18; vice-president, Anna L. Kuhn '20; secretary, Marion George '20; treasurer, Anna Corson '19.

The following is a complete record of meetings (apart from those of a business nature only) from the foundation of the club to the end of the year 1917–18.

November 12, 1917: "Human side of mathematics" by John H. Minnick, assistant professor in education (formerly instructor in mathematics).

December 10: "Early development of arithmetic" by Maurice J. Babb, assistant professor of mathematics.

January 14, 1918: "Application of elementary arithmetic in physics and astronomy" by Professor Edwin S. Crawley.

April 15: "Infinity" by Professor George H. Hallett.

THE MATHEMATICAL CLUB OF SMITH COLLEGE, Northampton, Mass. [*1918*, 91].

October 23, 1916: Social meeting.

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[1] At the University of Pennsylvania there were in 1917–18 approximately 900 women—graduate 200, in college courses for teachers 300, in arts 50, and in education 350—all (except graduates) being candidates for bachelor degrees.

November 13: Review of G. A. Miller's *Historical introduction to mathematical literature* by Florence Hatch '17; Review of *A summary of mathematics in the secondary school of tomorrow* by the Mathematics Club of Chicago High School Teachers, by Gertrude Schloo '17.

December 4: Social at the home of Professor Ruth Wood.

January 8, 1917: Review of "On the nature of mathematical reasoning" from Poincaré's *Science and hypothesis* by Muriel Irving '17.

February 12: Review of "Space and Geometry" from Poincaré's *Science and hypothesis* by Lillian Miller '17; Review of "A non-Euclidean world" from J. W. A. Young's *Lectures on fundamental concepts of algebra and geometry* by May E. Owen '17; [title of paper missing in club's records] by Eleanor E. Stearns '17.

March 5: "Lobachevsky's geometry" by Katherine Baxter '17; "Riemann's geometry" by Anna Hebel '18.

March 26: "Bolyai's geometry" by Ruby M. Burt '17;[1] Review of "Experiment and Geometry" from Poincaré's *Science and hypothesis* by Janie B. Bartlett '17.

April 30: "The fourth dimension" by Aline Hueston '17; "The slide rule" by Winifred L. Chase '17; "The integraph" by Professor Pauline Sperry.

May 21: Social meeting at Professor Eleanor P. Cushing's home.

February 11, 1918: Professor Harriet R. Cobb spoke of work at Columbia during two summers; Martha Chadbourne '14 described her graduate work at Harvard and Radcliffe.

March 4: "Pole and polar relations" by Florence B. Putnam '18; "Plane homologies" by Cornelia D. Hopkins '19.

March 25: Professor Ruth Wood spoke on her graduate study at the University of Göttingen; Professor Suzan R. Benedict told of graduate work at the University of Michigan.

April 29: "Brilliant points" by Martha Chadbourne Gr.

May 20: Social meeting.

THE MATHEMATICS CLUB OF VASSAR COLLEGE, Poughkeepsie, N. Y.   [*1918*, 136].

February 17, 1916: Organization meeting.

March 15: Election of officers; "Demonstration of Simpson's Rule" by Constance Andrews '16; "Explanation and discussion of the planimeter" by Mildred Allen '16.

April 20: "The equilateral hyperbola" by Frances Atwater '16; "Pascal's hexagon" by Mary McManus '16; "The path and range of projectiles used in modern warfare" by Ruth Core '16; "The construction of shells used in modern warfare" by Helen Moore '16.

May 12: "Some early stages in the evolution of algebra" by Professor Elizabeth B. Cowley.

October 24: Election of Officers; "Professor Mittag-Leffler's last will and testa-

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[1] The last three papers were based mainly on Chapter 3 of Poincaré's *Science and hypothesis*.

ment" by Caroline Bacon '17; "Explanation and discussion of the limit" by Roberta Pickering '17.

November 28: "The construction of some curves by linkages" by Helen Moulton '19 and Rachel Franklin '19: "The slide rule" by Katrina Jaggard '17.

December 13: "Lewis Carroll, author and mathematician" by Margaret Finck '17; "Mathematical recreations" by Beatrice Boyden '18.

February 20, 1917: "History of the adding machine" by Maxime Harrison-Berlitz '19; "Explanation and demonstration of the Burroughs adding machine" by Mr. Madison of the Burroughs Machine Co.

February 22: Election of officers.

March 1: "Mathematics in the secondary schools" by Dean Frederick C. Ferry of Williams College.

April 17: "The fourth dimension" by Mary Moher '16; Eleanor Hussey '16, and Mary Appelgate '17.

February 26, 1918: Election of officers for the second semester: President, Martha Braun '18; vice-president, Helen Thompson '19; secretary-treasurer, Louise Stuerm; Professor Cowley (faculty member of executive committee); Christie White '19 (member at large of executive committee); "Planimeters" by Marjorie Wheatley '18 [see *1918*, 136].

April 23: "A mathematical problem of warfare" by Elizabeth B. Conklin '18; "Mathematical fallacies" by Susan Barr '20.

May 7: Picnic.

The number of meetings of the club was smaller in the year 1917–18 than in the previous year because most of its members participated in red-cross work, in farming activities, or in a preparedness course in mechanical drawing. "Those students who wanted to go into government work or to enter offices of electrical companies found this course particularly useful."

THE JUNIOR MATHEMATICAL CLUB, University of Wisconsin, Madison, Wis. [*1918*, 188–9].

October 19, 1916: "American mathematicians" by Professor Edward B. Van Vleck.

November 2: "Graphical representation" by Professor Arnold Dresden.

November 16: "Pappus of Alexandria" by Mary Henry '17; "Models" by Professor Linnaeus W. Dowling.

December 7: "Three breakdowns in mathematics" by Professor Ernest B. Skinner; [title of paper missing from club's records] by Rachel McKannan '17.

January 18, 1917: "Work of Archimedes" by Professor Charles S. Slichter; "Life of Archimedes" by Margaret Chapman '17.

March 1: "Peano's theory of natural numbers" by Frederick Wood, instructor in mathematics.

March 15: [Details of program missing].

March 29: "Squaring the circle" by Professor Walter W. Hart; [title of paper missing] by Stella Andrews '17.

April 19: "Importance of notation" by Dr. Thomas M. Simpson, instructor in mathematics.

May 4: "Geometrical fallacies" by Mary Dillman '17; "Arithmetical fallacies" by Joseph L. Walsh Gr., travelling fellow from Harvard University.

May 18: "Relativity" by Warren Weaver Gr.

April 3, 1918: "Integers" by Professor Skinner.

April 17: "Progress in notation" by Meta Wood '17; "Fractions" by Professor Hart.

May 8: "Lantern slides on mathematicians" by Professor Dresden.

CLUBS REPORTING ON SESSIONS IN 1917-18.

The names of these 37 clubs are arranged chronologically according to the dates of their organization, and pages of this MONTHLY, 1918 where their reports are published are indicated.

The Mathematical and Physical Society of the University of Toronto, Toronto, Ontario.—Founded January, 1882. Membership (men and women) 75; Meetings 9; Average attendance 50. [Pages 229–231.]

The Mathematical Club, Harvard University, Cambridge, Mass.—Founded about 1898. Membership (men only). Meetings 12. Average attendance 20. [Pages 186–187, 449–450.]

The Mathematical Club of Smith College, Northampton, Mass.—Founded October, 1899. Membership (women only) 35. Meetings 11. Average attendance 24. [Pages 91, 455–456.]

Undergraduate Mathematics Club, University of Illinois, Urbana, Ill.—Founded December, 1899. Membership 36. Meetings 8. Average attendance 8–12. [Pages 404–405.]

Pi Mu Epsilon Fraternity, Syracuse University, Syracuse, N. Y.—Founded November, 1903. Membership (men and women) 44. Meetings 9. Average attendance 30. [Pages 271–273.]

Mathematics Club, The Western College for Women, Oxford, Ohio.—Founded 1905. Membership (women only) 28. Meetings 6. [Pages 231–232.]

The Junior Mathematical Club of the University of Chicago, Chicago, Ill.—Founded November, 1905. Membership (men and women) 15–20. Meetings 14. [Pages 34–35, 448–449.]

The Mathematical and Astronomical Club of Swarthmore College, Swarthmore, Pa.—Founded March, 1907. Membership 42. Meetings 16. Average attendance 30. [Page 135.]

Mathematics Club of Mount Holyoke College, South Hadley, Mass.—Founded November, 1907. Membership (women only) 53. Meetings 5. Average attendance 20. [Pages 312–313.]

The White Mathematics Club at the University of Kentucky, Lexington, Ky.—Founded November, 1908. Membership 7. Meetings 22. [Pages 90, 451–453.]

Barnard College Mathematics Club, Columbia University, New York.—Founded 1909. Membership (women only) 40. Meetings 6. Average attendance 25. [Pages 226–227.]

Mathematics Club of Iowa State Teachers College, Cedar Falls, Iowa—Founded December, 1909. Meetings 3. [Pages 311–312.]

The Mathematics Club of Hunter College, New York.—Founded 1910. Membership (women only). Meetings 8. [Pages 187–188.]

Mathematics Club of Columbia University, New York.—Founded November, 1910. Meetings 11. Average attendance 14. [Pages 227–228.]

The Mathematics Club of Albion College, Albion, Mich.—Founded January, 1911. Membership (men and women) 19. Meetings 15. [Pages 354–357.]

The Newtonian Society of the State College of Washington, Pullman, Wash.—Founded November, 1911. Membership (men and women) 14. Meetings 10. Average attendance 10. [Pages 410–411.]

The Mathematics Club of the University of Kansas, Lawrence, Kansas.—Founded December, 1911. Average attendance 19. Meetings 16. [Pages 35–36, 450–451.]

The Junior Mathematical Club, University of Wisconsin, Madison, Wis.—Founded March, 1912. Membership (men and women) 25. Meetings 7. Average attendance 18. [Pages 188–189, 457–458.]

The Mathematics Club of Goucher College, Baltimore, Md.—Founded November, 1913. Membership (women only) 22. Meetings 10. Average attendance 15. [Pages 357–358.]

Denison Mathematics Club, Denison University, Granville, Ohio.) Founded November, 1914. Meetings 11. Average attendance 25. [Pages 403–404.]

Junior Mathematics Club, University of Minnesota, Minneapolis, Minn.—Founded December, 1914. Membership (men and women) 20. Meetings 10. Average attendance 15. [Page 312.]

The Mathematics Club of Brown University, Providence, R. I.—Founded February, 1915. Membership (men and women) 60. Meetings 7. Average attendance 42. [Pages 33–34.]

The Mathematics Club, University of Colorado, Boulder, Colo.—Founded October, 1915. Membership (men and women) 41. Meetings 12. Average attendance 30. [Page 185.]

The Mathematical Club of the University of Nebraska, Lincoln, Neb.—Founded October, 1915. Membership about 60. Monthly meetings 7:30 to 9 P. M. Average attendance 35. [Pages 313–315.]

The Mathematics Club of Northwestern University, Evanston, Ill.—Founded January, 1916. Membership (men and women) 20. Meetings 10. [Pages 132–134, 409.]

The Mathematics Club of the University of Maine, Orono, Me.—Founded February, 1916. Membership (men and women) 18. Meetings 7. Average attendance 8. [Pages 132, 453–454.]

The Mathematics Club of Vassar College, Poughkeepsie, N. Y.—Founded January, 1916. Membership (women only) 37. Meetings 6. [Pages 136, 456–457.]

The Mathematics Club of the University of North Carolina, Chapel Hill, N. C.—

Founded October, 1916. Membership 25. Meetings 10. Average atten-
dance 15–20. [Pages 90–91, 454–455.]

The Mathematics Club of the University of Oregon, Eugene, Oregon.—Founded
October, 1916. Membership 30. Meetings 4. Average attendance 20.
[Pages 134–135, 455.]

The Pentagram, University of Texas, Austin, Texas.—Founded October, 1916.
Membership (men and women) about 30. Meetings 15. [Pages 273–276.]

The Mathematics and Physics Club of the University of Alabama, University,
Ala.—Founded November, 1916. Meetings 4. Average attendance 12.
[Page 226.]

The Mathematics Club of Greenville College, Greenville, Ill.—Founded Septem-
ber, 1916. Membership (men and women) 25. Meetings 6. Average atten-
dance 20. [Pages 89–90.]

The University of Saskatchewan Mathematical Society, Saskatoon, Sask.—
Founded November, 1916. Meetings 6. Average attendance (men and
women) 14. [Pages 270–271.]

The Grinnell College Mathematics Club, Grinnell, Iowa.—Founded March,
1917. Membership (men and women). Meetings 6. [Page 449.]

Vinculum, University of Pennsylvania, Philadelphia, Pa.—Founded May, 1917.
Membership (women only) 20. Meetings 5. [Page 455.]

Mathematical Club of Rockford College, Rockford, Ill.—Founded October,
1917. Membership (women only) 24. Meetings 9. [Pages 188, 409.]

The Mathematics Club of Connecticut College, New London, Conn.—Founded
December, 1917. Membership (women only) 7. Meetings 6. [Page 270.]

Mathematics Club of the University of Montana, Missoula, Montana.—Founded
March, 1918. Membership (men and women) 22. Meetings 6. Average
attendance 18. [Pages 408–409.]

It may be remarked that more than half of the Clubs were founded within
the past four years: that nine were organized in 1916, four in 1917, and one in 1918.

Nearly one quarter of the clubs are for women only: Connecticut, Goucher
Hunter, Mt. Holyoke, Pennsylvania, Rockford, Smith, Vassar, and Western.

The number of members in the various clubs varies from less than 10 in such
places as Connecticut and Kentucky, to more than 50 at such places as Mt.
Holyoke, Brown, Nebraska and Toronto. The number of meetings has varied
from 3–5 (for example at Iowa State, Alabama, and Pennsylvania) to 15–22
(for example at Albion, Swarthmore, and Kentucky).

1918—SUMMARY NOTES.

During the year an attempt has been made clearly to indicate the ideals of
(1) every American undergraduate mathematical club which held meetings during
1917–18, as well as of (2) the following three clubs which deemed it wise to sus-
pend operation for that year:

The Euclidean Circle of Indiana University, Bloomington, Ind.—Founded
September, 1907. [Page 228.]

The Mathematical Club of the Kansas State Agricultural College, Manhattan, Kansas.—Founded September, 1913. [Pages 405–408.]

The Mathematics Club of the University of Oklahoma, Norman, Okla.—Founded October, 1916. [Pages 315–316.]

To this end, in so far as information was procurable each club's organization has been described, and its programs for one or more years have been published.

It is hoped that this material has served, and will serve for some time to come, as a fruitful source of suggestion as to possible methods of club organization and conduct, and as to ideals which may be successfully tried out. A sample constitution (at Oklahoma) has been published, and it has been observed that most clubs favor formal organization with student officers, and a member of the faculty serving in advisory capacity on either the program or executive committee. At such places as Barnard, Saskatchewan, and Toronto, an honorary president is chosen by the students from the faculty, while all other officers are students. Six clubs have student officers only; Iowa State, Kentucky, North Carolina and Syracuse favor faculty control of practically all offices; informality in organizations is characteristic of Brown, Colorado, Goucher and Western. Just what type of control should be maintained by the faculty must often be determined by local conditions.

The facsimile of the certificate of membership at Texas given on page 275, the printed programs of Greenville, Kansas, Kansas State, and Toronto, and the club photographs arranged for at Brown, Greenville, and Indiana, will serve as interesting suggestions.

The address in our October issue, by an experienced teacher who has, for many years, met with great success in his conduct of clubs, sets forth the extreme value of the club and the great importance of considerations involved in the preparation of its programs. During the year more than 650 published programs must have offered helpful suggestions in this connection and made clear to many readers how vital a factor the club may be made in the mathematical, intellectual, and social life of a college.

The Albion program scheme which allots some task to every member at frequent intervals, such plans as those at Goucher, Kansas State, Kentucky, and Wisconsin, for working up portions of the history of mathematics in connection with club programs, and the very general introduction into club programs of biographies of mathematicians, are also noteworthy.

While titles of appropriate program topics are suggestive there are few clubs which do not feel the need of indications of possibilities of the topics, and of exact references to the literature. It was with this idea in view that a beginning was made in meeting this need and the following subjects were treated during the year: 1. The oldest mathematical work extant; 2. Geometrography and other methods of measurement of geometrical constructions; 3. Arithmetical prodigies; 4. Ptolemy's theorem and formulæ of trigonometry; 5. Paper folding; 6. Women as mathematicians and astronomers; 7. The binary scale of notation, a Russian peasant method of multiplication, the game of mim, and Cardan's rings; 8. The

logarithmic spiral; 9. Golden section; 10. A Fibonacci series; 11. Euler integrals and Euler's spiral—sometimes called Fresnel integrals, and the clothoïde, or Cornu's spiral; 12. Geometry of four dimensions; 13. Constructions with a double-edged ruler; 14. The cattle problem of Archimedes.

With one exception (because calculus is involved) all of these topics are suitable for programs of every one of the clubs mentioned above. In most cases far more was suggested than was regarded as possible for consideration in a single evening. The bibliographies were purposely made pretty full, partly because the synopses were contributions to mathematical history, and partly that the resources of each library might be laid under contribution when possible. It was not intended that anything of real importance and interest should have been overlooked; nevertheless it was not noted till too late that (1) Campanus, in the thirteenth century, proved the irrationality of golden section and that his argument (by mathematical induction) was reproduced by Genocchi and Cantor;[1] that (2) discussion connected with Fibonacci's series occurs in the writings of Daniel Bernorilli as early as 1728 and of Euler by 1726 (facts to which Mr. G. Eneström of Stockholm has kindly drawn my attention); and that (3) Euler's spiral has played an interesting and important rôle in connection with the history of railroad curves. The literature of this subject has been surveyed by the editor and it is possible that at a later date the results of his inquiry may be thrown into the form of a club topic.

* * *

The following passage of a personal letter to the editor, from a distinguished professor in a Scottish University, will be of general interest.

"But what I want most to write about today is to thank you for, and to offer you a word of appreciation of, your bulletin of the 'Undergraduate Clubs.' We have nothing like this over here, and the whole thing strikes me as admirable. It seems to me that it might with immense advantage be extended (as perhaps it already is on your side) to other sciences as well as to mathematics. Our better students either drop their work altogether on graduation, or either insist on attempting, or perhaps are tempted (for instance by the Carnegie Scholarships) to attempt, 'original investigation' before they are fit for it. There is no temptation and little opportunity to prolong their own studies, to engage in wider reading or to make acquaintance with the historical aspect of their science. Often a comparatively raw youth or girl comes to me and wants to 'do original research.' I say 'Why, you have read nothing but a text-book or two; you have read nothing worth speaking of. Why not read for a year or two; make yourself master of what has been done in this field or that, and widen your horizon. Epitomize the literature of some theme, or of some historical period.' But the reply is always the same. 'I want to do "original research"'; and the Carnegie

[1] *Annali di scienze matematiche e fisiche* (Tortolini), tomo 6, pp. 307–308; Cantor's *Vorlesungen über Geschichte der Mathematik*, Band 2, 2. Auflage, 1900, p. 105. See also this MONTHLY, 1918, page 197.

Trust will give me a good scholarship for doing so, and for nothing else in the world.' Now your plan seems to me to precisely meet the case. You encourage your young people to do *work*—not necessarily 'original work'—which is more than any reasonable man can expect of them; but at least work which involves just so much originality or at least independence as can fairly be expected. And it is work by which they learn something; while heaps of so-called original work, as I see it done, teaches nothing, for it is too often confined to some tiny problem, and only means watching the spot of a galvanometer, or making endless and all but identical titrations or measurements."